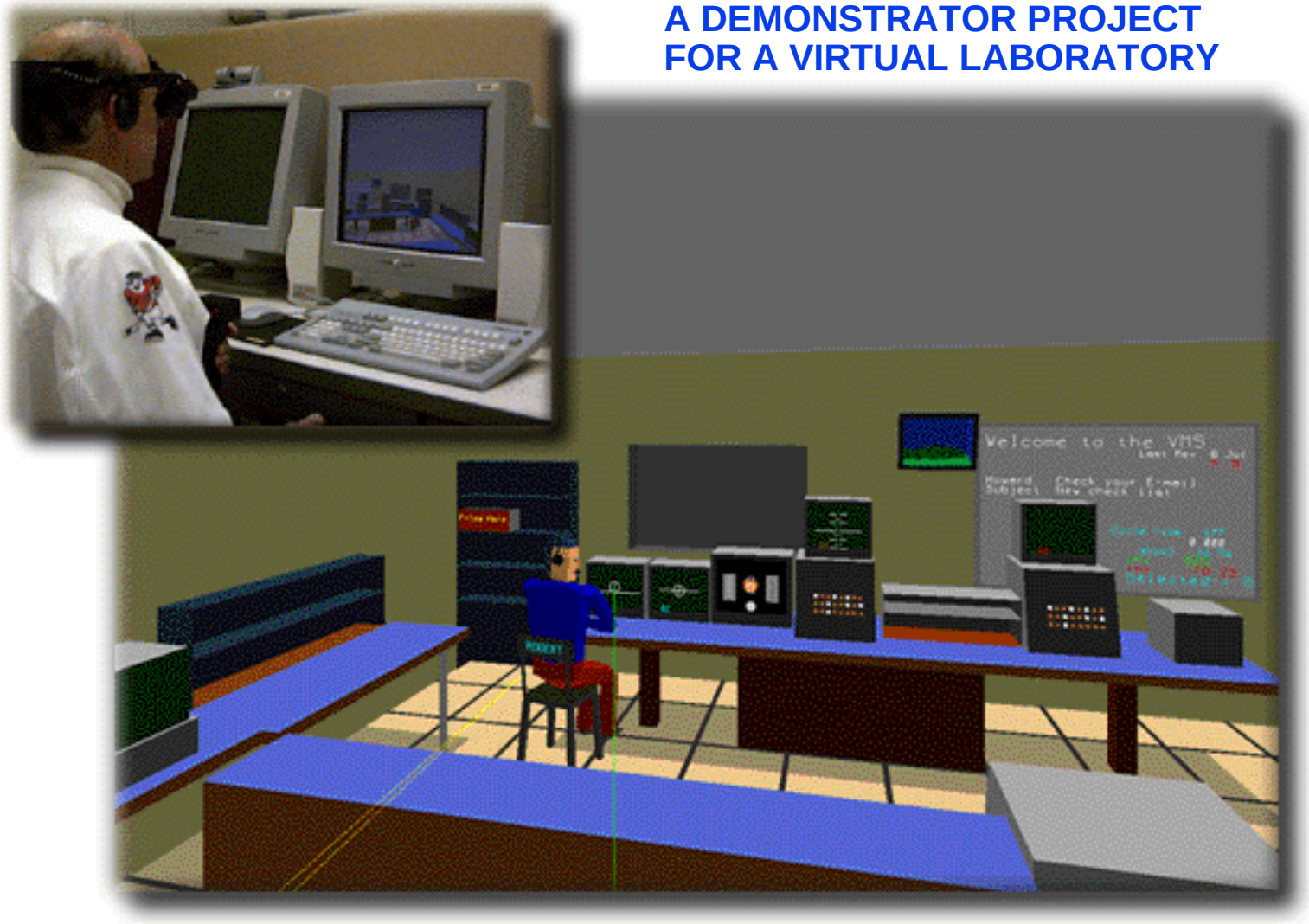
Ames Research Center
Aeronautical Test and Simulation Division

VIRTUAL SIMULATION LABORATORY

A DEMONSTRATOR PROJECT FOR A VIRTUAL LABORATORY



Simulation Laboratories

DEMONSTRATOR PROJECT SUMMARY

- **WHAT - A virtual environment providing remote access to ARC simulation laboratories for interactive participation with live experiments, simulation model, controls and display development, virtual prototyping, and data browsing capability all from the researchers desktop.**

- **WHY - Expedites delivery of aeronautical knowledge, gleaned from the unique motion cueing, full mission, and airspace operations capabilities of ARC simulation experiments, to bear on the design processes of US aircraft industry.**

- **HOW - Leverage off the information technologies inherent to real-time simulation to create an immersive, highly interactive, virtual environment tailored specifically to the needs of the aeronautical design process.**

- **WHEN - Demonstrator project will deliver a fully functional prototype, situated at JSC, with Rockwell and Lockheed researchers interacting with a Space Shuttle simulation operating on the VMS within one year.**

- **HOW MUCH - The cost for this prototype will be $627K and will include all procurement and labor expenses.**

THE VIRTUAL LABORATORY

> ***A VIRTUAL ENVIRONMENT PROVIDING REMOTE ACCESS TO ARC SIMULATION LABORATORIES***

- **Monitor and actively participate in a simulation experiment from any location in US**
  - **user defined displays**
- **Integrated desktop development system allows researcher to;**
  - **develop math models, displays, control systems**
  - **validate models for higher quality experiments**
  - **provide fully compatible S/W modules to SimLab**
- **Virtual prototyping**
  - **cockpit design**
  - **lab data system layouts**
- **Demos, PR, education**
  - **demos made available regardless of location**
  - **include multiple groups simultaneously**
  - **low cost observers stations**

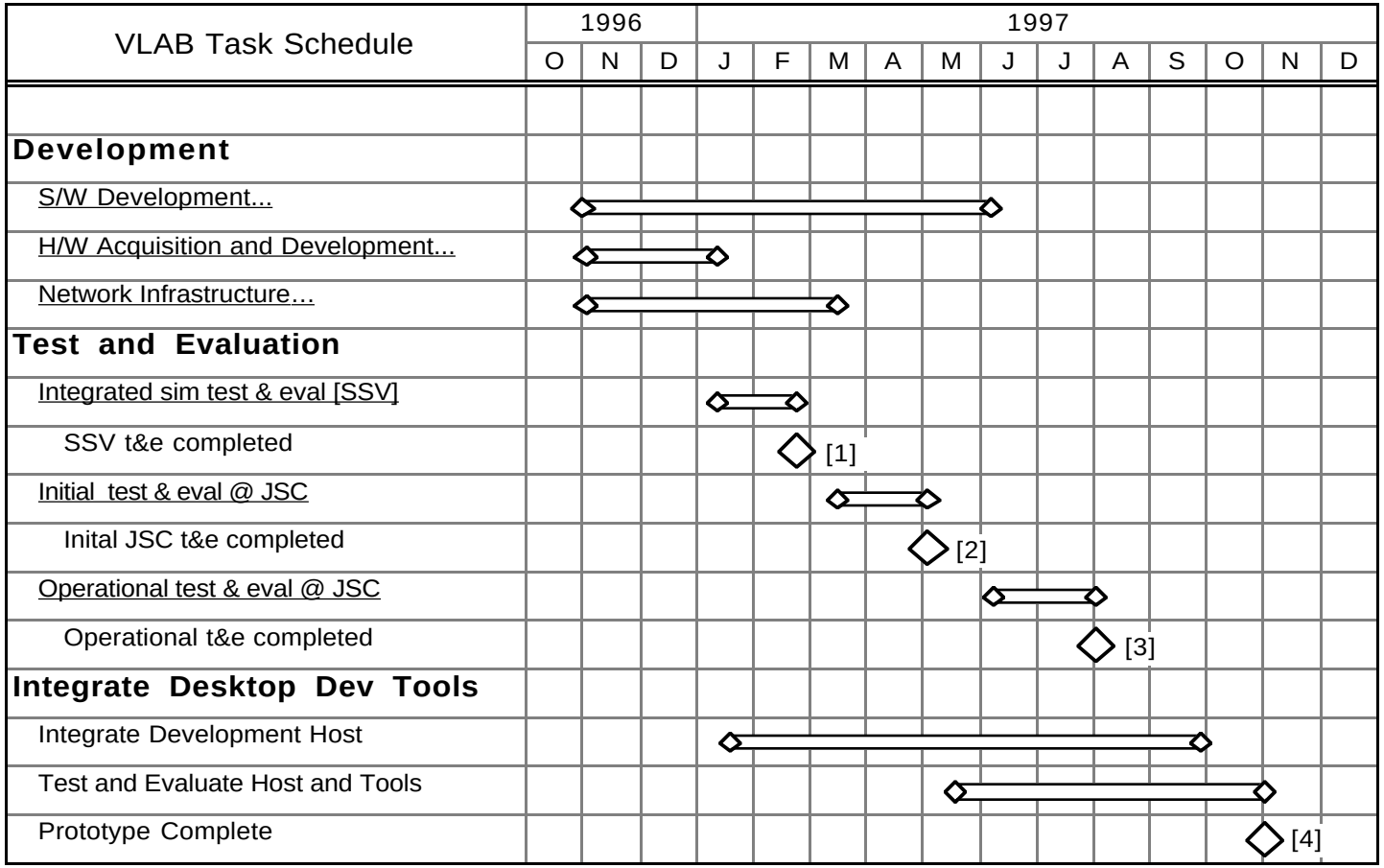
CENTRAL ROLE OF SIMULATION IN AIRCRAFT DESIGN CYCLE

- Delivers NASA's simulation capability to industry's doorstep
  - ARC simulators are high fidelity, research oriented facilities
  - ARC simulators can be used for specific, focused purposes as well as basic research topics
- Allows industry to iterate design steps with piloted simulation
  - faster, less expensive pilot-in-the-loop evaluation of designs
  - closes loop with CFD and WT testing for better design decisions earlier in the process
  - interoperability among AOS facilities such as ATC, SDTF, full mission, and part task
  - collaborative work with Neural Net simulations (Code I)
- Enables industry/government partnerships to the benefit of US aeronautics
  - easier access to National facilities
  - shared databases
  - more effective and efficient design process

VIRTUAL LABORATORY APPROACH

- Real-Time simulation methodologies completely congruent with information technologies
  - hardware and software issues are the same
  - emphasis on attainment of knowledge, rather than collection of data
- Benefit from collaborative partnerships with Code I, industry, research community
  - share/borrow technology
  - remain focused on solutions to real needs
- Server/Client model
  - possible High Level Architecture (HLA) approach
  - low cost COTS hardware
  - COTS plus custom software

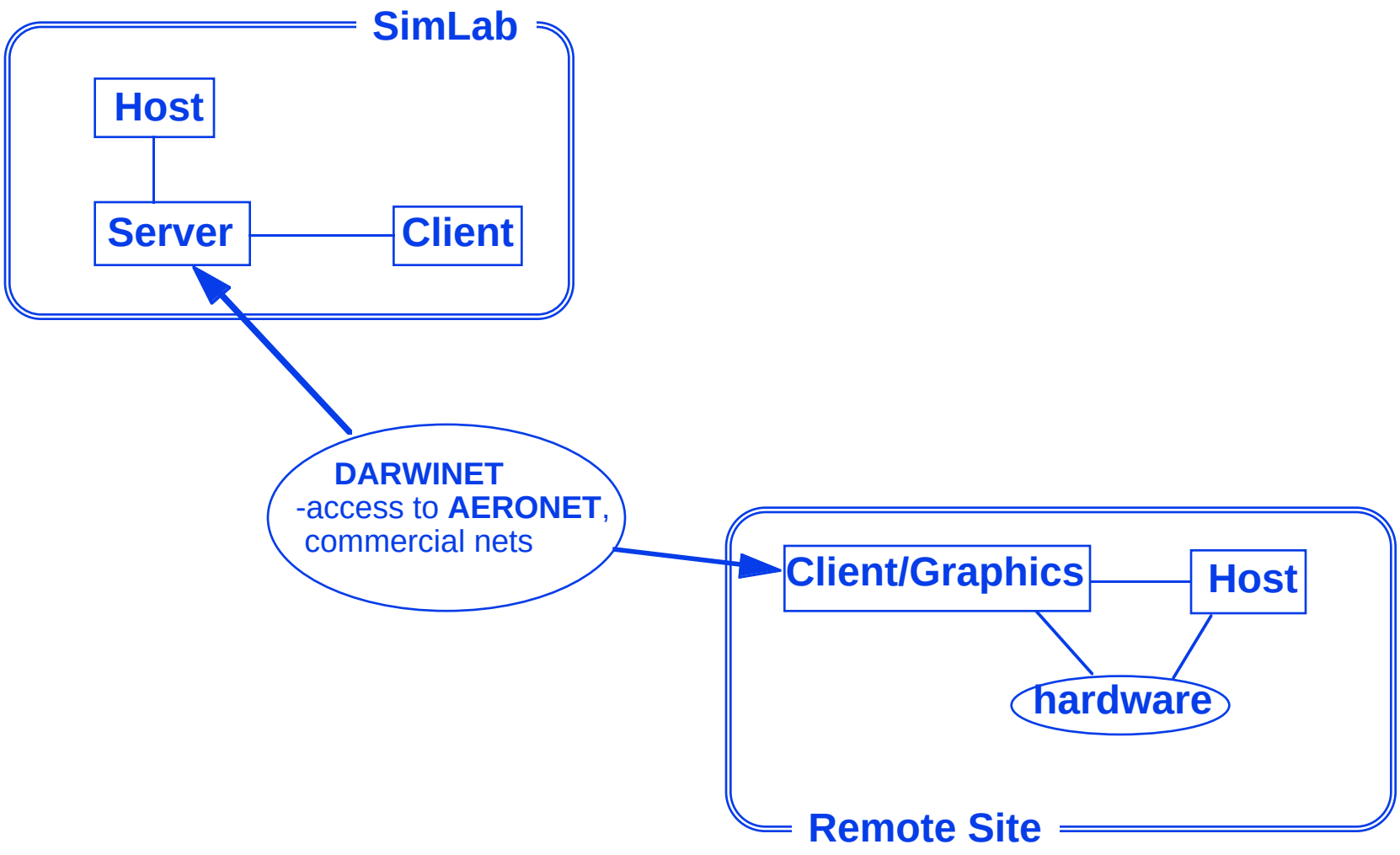
DEMONSTRATOR PROGRAM SCHEDULE



DEMONSTRATOR PROGRAM BUDGET

	Acquistions (x $1000)	Labor (person-month)	Labor (x $1000)
Development	$312	19	$143
Test and Evaluation	$30	11	$83
Integrate Dev Tools	$0	8	$60
Total Cost	**$342**	**38**	**$285**

[note] Labor Cost = (38) person- months ÷ 12 mon/yr x $90k/person/yr

Total Estimated Cost = $ 627 K

POSSIBLE SYSTEM ARCHITECTURE